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L E T T E R,

From F. BECCARIA to Mr. WILSON,

C O N C E R N I N G

The Light exhibited in the Dark by the BOLOGNA  
PHOSPHORUS, made according to Mr. CANTON's  
method, and illuminated through coloured glasses.

*Turin, May 29, 1776.*

I DID not receive your letter, of the 19th of March 1776,  
before last week; and here is all that I can answer to the  
queries you have therein proposed.

I made in the winter of the year 1771 the experiment on phos-  
phorus, which being illuminated through coloured glasses, and  
uncovered in the dark, exhibited some tint of the colour of the  
glass. I made and repeated this experiment in the morning, in a  
room situated towards the east, the sun not being much above the  
horizon, and not very clear, which it never is with us in that  
season.

I undertook



L E T T E R A

A L S I G N O R B. W I L S O N,

Intorno alla luce, che mostra nel bujo il Fosforo di Bologna, fatto giusta  
il metodo del signor CANTON, e illuminato attraverso a' vetri coloriti.

*Torino 29. Maggio 1776.*

NON ho ricevuto che nella scorsa settimana la lettera vostra data i 19. Marzo 1776.,  
ed ecco cosa posso rispondere intorno alle dimande, che in essa mi fate.

Io feci nell' inverno dell' 1771. la sperienza del Fosforo, che illuminato attraverso a'  
vetri coloriti, e ignudato nel bujo mi appresentava alcuna tinta del colore de' vetri. Feci,  
e repplicai tale sperienza il mattino in una stanza, che guardava a levante, il sole era  
poco alto sull' orizzonte; nè mai era molto chiaro, come quì è solito in tale stagione.

Io

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I undertook this experiment with a view to continue the subject; but wanting leisure and opportunities, I thought proper to communicate it to Mr. Canton, who had newly published in the Phil. Transf. his curious experiments concerning the same phosphorus, by which he proved, that the phosphorus preserved from moisture does not lose it's phosphoric nature; that being kept some time in the dark, or being properly warmed in the dark, it shews no further light, unless it be again exposed to the light.

As I was writing to so eminent and experienced an author, I did not think it necessary to enter into a long or minute detail. There was no danger of his mistaking for deep colours those, the idea of which I meant to convey by the words *virescere, rubescere, flavescere*: for, besides that such words do not indicate more than the beginning of a colour, Mr. Canton knew too well that compound rays pervade the coloured glass; and that the primitive ray, corresponding with the colour of the glass, passes only in some greater proportion, contrary to what you have thought and asserted, p. 80 and 81 of your Series, that *the red glass transmitted only the red-making rays*. I have endeavoured to excuse this assertion of yours, by laying it to the charge of the copyist or the printer, but the argument you thence deduced rendered it impossible.

Until

Io impresi tale sperienza con animo di continuare in tale materia; ma mancandomi l'ozio, e il comodo pensai di scriverla al sig. Canton, il quale avea di fresco esposto nelle Transazioni Anglicane le sperienze sue bellissime intorno al Fosforo medesimo, colle quali mostrava, che il Fosforo difeso dall' umido non perde la natura di Fosforo, che tenuto lungamente nel bujo, o scaldato nel bujo convenientemente, non mostra altra luce, se prima non si espone alla luce di nuovo.

Scrivendo a tanto celebre, e tanto esercitato autore non mi parve necessario un lungo, e minuto racconto. Non v' era pericolo, ch' esso prendesse per colori decisi quelli, che io indicava colle parole *virescere, rubescere, flavescere*; perciocchè oltrecchè tali parole non segnano che cominciamento di colore sapea troppo bene il signor Canton, che pe' vetri coloriti passa la luce composta, e che non passa che in alcuna copia maggiore il raggio primigenio corrispondente al colore del vetro, all' opposto di quello, che avete pensato, ed affermato voi alla fine della pagina 80, e al principio della 81, della vostra Serie — *The red glass transmitted only the red-making rays* — il vetro rosso trasmettea solamente i raggi facitori del rosso. Mi sono studiato di scusare tale vostro passo con alcun errore, che sia avvenuto per negligenza del copista, o dello stampatore; ma non mi è stato possibile stante il ragionamento, che voi fate in tale luogo.

Fino

Until Mr. Magellan informed me that my experiment, on being repeated, had not succeeded, I was so firmly persuaded of it's truth, that I availed myself of it in some verses in praise of a worthy nobleman, in which I displayed it with all the energy that is permitted to, or rather expected from, a poet.

When in August, 1772, Mr. Magellan wrote to me to desire I would acquaint him with the manner in which my experiment had been made, I was the less solicitous to repeat it myself, seeing it already in other hands; I ingenuously answered his request by the part of the letter which you published in the 3d page of your Additions.

Having since, in the last year, received your Series of New Experiments on Phosphori, all the doubts I might have entertained concerning the truth of my experiment must have vanished.

For, in the first place, it followed, from your assuming the principle that the coloured glasses are pervaded only by the rays that constitute the colour of those glasses, that I am supposed to have thought, that you expected to see deep colours in my experiment; and that you yet denied it, not because it did not succeed with you as I thought it had succeeded with me, but because you pretended to see it in a manner that is absolutely impossible. (a)

(a) The reader will see this charge answered in p. 8. of this sheet.

But

Fino a tanto che il signor Magellan non mi scrisse, che la mia esperienza tentata da alcuno non riusciva, io restai sì fattamente persuaso della verità di essa, che me ne valsi in alcuni pochi versi di encomio di degnissimo Cavaliere, e in essi versi la esposi con tutta quella licenza, che la poesia soffre, ed anzi richiede.

Quando nell' Agosto del 1772 il sig. Magellan mi scrisse d'indicargli la maniera della mia esperienza, io allora tanto meno fui sollecito di replicarla io medesimo, vedendola nelle mani altrui; ingenuamente risposi intorno a ciò quella tale parte di lettera, che voi avete pubblicata nella pag. 3. delle vostre addizioni.

Ricevuta poi nell' anno scorso la vostra Serie di nuovi sperimenti su i Fosfori, tutti i dubbj, ché si erano potuti eccitare in me intorno alla verità della esperienza mia hanno dovuto svanire.

Perciocchè primamente assumendo voi il principio, che per li vetri coloriti passino unicamente i raggi facitori di quel tale colore, di che i vetri sono coloriti, ne seguivà, che io dovesti credere, che voi aspettavate dall' esperienza mia colori decisi; e che però voi la negaste non perchè non vi riuscisse, come io pensava essere riuscita a me; ma perchè pretendeste di vederla, come è assolutamente impossibile.

Ma

But I was still more confirmed in my opinion, that my experiment was perfectly similar to one of your own, and that they were equivalent, although you deny it; having observed at the 80th page of your Series, just before you assume the false principle *that the red glass transmitted only red-making rays*, that you made an experiment in the following manner; — you put an oyster-shell into a cylindrical box, which being exposed uncovered to the sun, exhibits in the dark the prismatic colours very intense; and then exposing it covered with a coloured glass, and uncovering it in the dark, you see on the shell that colour somewhat more intense, which corresponds with the colour of the glass.

Now according to the common notions, it is equivalent whether *the phosphorus which shews the different colours, shews that colour which corresponds with the glass in a more lively tint*, in which consists your experiment, or *whether the phosphorus which shews the compound light, exhibits some tint of the colour of the glass*, which is the purport of my experiment. And particularly apposite to this reasoning of mine is the following paragraph in your friend Mr. Magellan's letter: *Your argument derived from Mr. Wilson's own experiments, who says that he has seen the coloured phosphori more coloured in the part of the colour of the glass which covered them, (whilst exposed to light) is the strongest confirmation of your experiment; and I consider it as absolutely unanswerable.* Now,

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Ma anche più di questo mi confermava nell' opinione, che l' esperienza mia fosse pur vera una speranza vostra individua, equivalente alla mia, che voi negavate. Perciocchè alla pag. 80. della vostra Serie, appunto immediatamente avanti di assumere il principio notoriamente falso - - *the red glass transmitted only red-making rays* - - voi sperimentate nella seguente maniera. Mettete in una scatoletta cilindrica una conchiglia, la quale esposta nuda al sole mostra al bujo i colori prismatici intensamente vivaci; la esponete al sole coperta da un vetro colorito, e scoprendola al bujo vedete nella conchiglia un po' più vivace quel colore, che corrisponde al colore del cristallo.

Ora giusta le comuni nozioni è cosa equivalente, che il *Fosforo atto a mostrare i diversi colori mostri più vivace il colore corrispondente al colore del cristallo*, nel che consiste la speranza vostra, e che il *Fosforo atto a mostrare la luce composta mostri alcuna tinta del colore del cristallo*, nel che consiste la speranza mia.

E appunto a proposito di questo mio ragionamento l'amico vostro il signor Magellan mi scrive il seguente articolo - - *il vostro argomento preso dall' esperienza del signor Wilson medesimo, che dice di aver veduti i Fosfori a colori coloriti più fortemente nella parte del colore istesso del vetro, che li copriva (nell' atto che erano illuminati) è senza dubbio una delle più forti conferme, che si possa avere della vostra speranza, ed anzi io la risguardo assolutamente senza replica.* Ora

Now, notwithstanding all this, notwithstanding, I say, my first persuasion, and notwithstanding the conclusive confirmation suggested by your own experiment, which is equivalent to mine; yet because my experiment does not succeed either with Mr. Burriot, or with you, or with Mr. Magellan, and more so because I have read in the memoirs of Bologna, that Mr. F. M. Zannotti, the worthy president of that institute, who is inclined in this matter to the opinion to which you propose your theory as a new one, had already seen the phosphorus yield the common light after it had been illuminated by primitive rays (*b*); I must confess to have been deceived in my experiment, perhaps because I have taken for very light tints of colours (which only could be expected) what was merely a faint gradation of light, or a different degree of shade.

It remains now for you to reconcile the falsity of my experiment with the truth of yours, from which your own friend thinks that the truth of mine necessarily follows. I am surprised that you should not have made any mention of that experiment of yours in the additions which you have lately published, since you certainly were not ignorant of what I had written last year concerning the connexion of your experiment with mine.

*(b) To prevent the reader from misapprehending this paragraph, (which F. Beccaria seems to have incautiously expressed) Mr. Wilson would observe, he received a letter from Mr. Zannotti, dated the 20th of January, 1776, that does not countenance the idea, which the reader might imagine to be conveyed in those expressions of F. Beccaria, respecting the experiment with the primitive rays.*

But

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Ora per altro tutto ciò non ostante, non ostante dico la prima mia persuasione, e non ostante la conchiudente conferma somministratami dall' esperimento vostro stesso, equivalente al mio; pure perchè nè al signor Burriot, nè a voi, nè al signor Magellan l' esperienza mia non riesce, e molto più perchè mi avvengo a rileggere ne' comentarj di Bologna, che il signor Francesco Maria Zannotti preside degnissimo di quell' istituto, il quale proponeva in questa materia all' opinione, cui voi proponete come nuova teoria vostra, avea già veduto a rendere la solita luce il Fosforo illuminato da' raggi primigenj; io debbo convenire d' essermi ingannato nella speranza mia forse perchè ho preso per tinta di colori leggerissimi (quale unicamente si dovea aspettare) ciò che era unicamente una varia degradazione di luce, o una diversa maniera d'ombra.

Resta ora, chiarissimo Signore, che voi colla falsità dello sperimento mio conciliate la verità del vostro, dal quale lo stesso amico vostro crede, che la verità del mio consegua necessariamente. Del quale vostro sperimento io resto maravigliato, che voi non abbiate fatta altra parola nelle addizioni, che avete recentemente pubblicate; perciocchè certamente voi non ignoravate ciò, che io avea scritto l' anno scorso della connessione dell' esperimento vostro medesimo col mio.

Ma

But this silence in you does not surprise me so much as what you say concerning your notoriously false assertion, *that the red glass transmitted only the red-making rays*. In the fourth experiment you prove yourself the falsity of this principle, which I had already combated last year.—You admit a sun-beam into the dark through a coloured glass; you divide it with a prism, and you observe that it presents the common whole spectrum of all the colours, with this only difference, that in this spectrum the colour corresponding with the colour of the glass was a *little fuller, more intense, and livelier*.

I had written, that in order to be convinced of the falsity of your principle, it was sufficient to look at a white paper through coloured glasses. No one will blame you for having made another experiment in a matter concerning which none were wanting; but certainly no one will excuse you for the title which you prefix to that experiment. I leave you to judge whether I translate it right: “In order to satisfy myself that the different coloured glasses used in Beccaria’s Experiments were incapable of transmitting the respective rays of their own colour unmixed with other rays, I made the following Experiment.” (Additions, page 8 and 9.)

It is you, Sir, and not I, that have adopted this strange principle, which is notoriously false, *Because the red glass transmitted only red-making rays* (Series, p. 82); I have pointed out the falsity of  
of

Ma anche più di tale vostro silenzio mi sorprende il parlare, che voi fate in esse addizioni della vostra asserzione notoriamente falsa — *the red glass transmitted only the red-making rays*. Nella sperienza quarta voi stesso provate la falsità di questo principio, intorno alla quale falsità io avea scritto l’ anno scorso. Introducete nel bujo attraverso a’ vetri coloriti il raggio del sole; lo dividete col prisma, e osservate, che ne risulta l’ ordinario intero spettro di tutti i colori con questo solo divario, che nello spettro era un po’ più pieno, più intenso, e più vivace il colore corrispondente al colore del vetro.

Io avea scritto, che per convincersi della falsità del vostro principio bastava mirare una carta bianca attraverso a’ cristalli coloriti. Niuno vi riprenderà, che voi abbiate fatta un’ altra sperienza intorno a un punto, in cui non ne abbisognava nessuna: ma certamente niuno vi scuferà del titolo, che voi prefigete a tale sperienza: mirate se lo traduco bene.

*Per soddisfare me stesso, che i cristalli diversamente coloriti impiegati nello sperimento di Beccaria erano incapaci di trasmettere i rispettivi raggi del loro proprio colore non misti con altri raggi, io ho fatta la seguente sperienza* (Additions, pag. 8. & 9.).

Signore, siete voi, non io, che avete assunto tale strano principio notoriamente falso — *Because the red glass transmitted only red-making rays* (Series pag. 82.). Io ho accennata  
la

of this principle of yours, which needs only be mentioned in order to be demonstrated; and yet whoever reads this title must take it for granted that it had been adopted by me rather than by you.

Now such *finesses* do more harm than good; and at least in the French translation you should change that title, and substitute something to the following purport:

“ In order to convince myself that I (B. Wilson) was mistaken  
“ in asserting that *the red glass transmitted only red-making rays*, I  
“ made the following experiment, &c.”

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la falsità di tale principio vostro; che appunto bastava accennarla per dimostrarla. Eppure chiunque legge tale titolo dee credere, che tale principio sia stato assunto da me più tosto che da voi.

Ora simili finenze fanno più torto di ogni altro errore; epperò almanco nella traduzione francese dovete cambiare tale titolo, e sostituire il seguente, od altro equivalente.

Per convincermi, che io (B. Wilson) avea errato affermando *that the red glass transmitted only red-making rays*, ho fatto il seguente sperimento, ec.

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To the Reverend Father BECCARIA, Professor of  
Natural Philosophy at Turin.

*Learned Sir,*

I Was lately favoured, by Mr. Magellan, with a copy of a printed letter of yours, dated Turin, 29th of May, 1776, and addressed to me; by which I find that we have misunderstood each other on the subject of Phosphori: and therefore some explanation on my part may, on that account, be necessary.

The translation of your letter (to Mr. Canton), which is printed in the Series of experiments upon phosphori, page 77, having been put into my hands when I was employed about that work, I attempted to repeat the experiment you had mentioned in that letter: but though, upon trial, I was not able to perceive the colours which I apprehended you had observed; yet, having been rather prejudiced in favour of your experiment, partly, perhaps, from self-diffidence, and partly from the opinion I had entertained of your great abilities, so well known to the learned world, I was thereby induced to lean a little towards your opinion: and therefore, when I printed the first edition, I expressed myself accordingly; that is, in a *doubtful* manner. See p. 80. Exp. 4. But in your quotation of that experiment the *doubtful part* is *omitted*. My words are these: “ On removing this glass (meaning the red) in the  
“ dark, after the shell in the box had been exposed to the sun, the prisma-  
“ tic

“tic colours appeared; and I could not perceive any alteration in them, except that they were fainter; but *I think* that the red was the least so.”

The same idea of a doubt you will find to be expressed in the very next paragraph, where mention is made of my trying the effects of your other coloured glasses.

But some months after this edition was published, when I proceeded in making further experiments, I soon discovered that I had no reason to *think* there was the *least colour perceptible* in any of the cases where the different-coloured glasses were employed; because, the pure *green, blue, or violet* rays of light (without any of your glasses) did excite, in my prepared phosphorus, a *far better red* light than *even the red rays themselves*. This being an uncontrovertible fact, I said, and still say, that phosphori (in these circumstances at least) do not emit the same light which they receive. For these reasons I immediately struck out all that *doubtful part*, and in my second edition you will find it so corrected; although, from your taking no notice of that alteration, I must conclude the second edition has not yet reached you, but that you have seen only a copy of the *Additions*. This, I hope, will be considered as a sufficient answer to that part of your printed letter, where you express a surprise that I had taken no notice of your experiment's having a connexion with mine. For when you read the second edition I allude to, you will, I apprehend, find that your objections are entirely removed.

In regard to the false assertion which you charge me with, namely, that red glass transmitted only the red-making rays, I have acquainted you already, that the experiment was made upon seeing only the translation of the letter to Mr. Canton; and therefore, it is no wonder that I should consider the phosphoric appearances as they are really stated in that translation; and more especially as I had no doubt but that it was very correct. Yet at the same time I do admit, that the passage, as it stands in the first edition, page 80 and 81, is somewhat ambiguous; and therefore, to render it more clear and intelligible, I ought to have printed it thus: “because the red glass (according to Father Beccaria's supposition) transmitted only the red-making rays.”

Upon the whole, you see, my good Sir, that whether the colour you thought you had observed was *redish*, or, as I have put it, (from the translation) absolutely *red*, it makes no difference, as the matter of fact now stands; because, from the nature of these new experiments I made with the different rays of light mentioned above, and which are published at large in the Additions to the second edition I sent you, no appearance of a *red* or *redish* light whatsoever (under the circumstances you have stated) can possibly take place.

Great Russell-Street, Bloomsbury,  
London, Sept. 23, 1776.

I am, S I R, with great esteem,

Your most obedient humble servant,

B. WILSON.



